MARKET ANALYSIS AND ENVIRONMENTAL EFFECT OF CLEAN COAL TECHNOLOGY

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Presented by

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Main Content

- Introduction of Zhejiang province
- Introduction of Clean Coal Technology(CCT) we involved
  - · clean coal (coal compound + additives)
  - · coal briquette
  - · coal water mixture
- Market analysis and environment effect of CCT

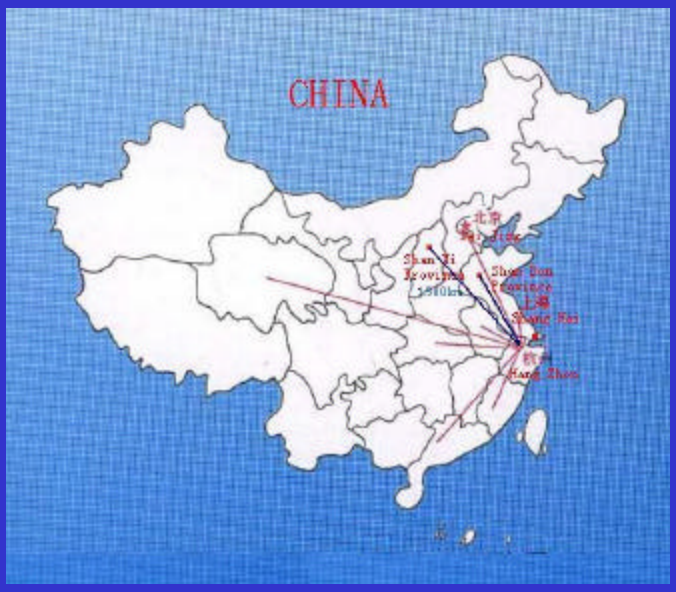
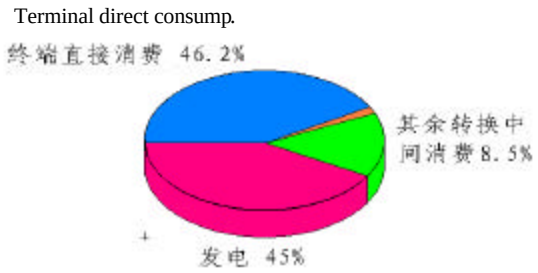


Table 1 The Development of National Economy via Energy Consumption in Zhejiang Province

Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	Average increasing rate
GDP£ billion yuan£ ©	89.8	108.18	136.51	190.95	266.69	352.48	414.61	463.82	498.75	
Increased rate compared with the former year		17.8%	19.0%	22.0%	20.0%	16.70%	12.7%	11.1%	10.1%	16.1%
GDP per capita£ yuan£©	2122	2540	3187	4431	6149	8074	9455	1051.5	1124.7	
Increased rate compared with the former year		17.1%	18.3%	21.3%	19.20%	15.9%	12.2%	10.4%	9.6%	15.4%
Financial income £ billion yuan£ ©	10.16	10.89	11.84	16.66	20.94	24.85	29.18	34.05	40.18	18.8%
Social fixed assets investment £ billion yuan£ ©	18.70	23.98	36.12	68.38	100.64	135.79	161.75	169.46	184.79	
Income of city residents (Yuan/household)	1769	1950	2415	3371	4691	5718	6956	7359	7837	
Electricity generation £ billion kwh£ ©	20.86	24.23	28814	30.85	33.192	40.147	44.836	48.577	53.916	
Electricity consumption £ billion kwh£ ©	23.03	26.31	30.33	34.68	39.67	43.96	47.93	51.15	54.78	11.4%
Coal consumption £ thousand tons£ ©	24860	28699	32195.2	35937	38894	42305	45911	47660	46526	8.15%
Total energy	25794	29480	32886	38209	42485	45803	48528	50683	52218	

Coal Consumption Composition of Zhejiang



For power generation

Table 2 Composition of Coal Consumption in Zhejiang Province

Items	1990	1991	1992	1993	1994	1995	1996	1997	1998
Total consumption £ thousand tons£ ©	24860.2	28699.9	32195.2	35937.8	38893.9	42305	45910.5	47660	46525.8
Terminal direct consumption£ thousand tons£ ©	15469.9	17589.3	19476.4	21715.2	22430.4	23012.5	22682.8	22036.9	21475.8
Ratio %	62.2	61.3	60.5	60.4	57.7	54.4	49.4	46.2	46.2
Mediated consumption of processing and converting £ thousand tons£ ©	9148.3	10874.9	12502.8	13993.6	16274.5	19137.5	23058.2	25189.2	24907.5
Ratio %	36.8	37.9	38.83	38.9	41.8	45.2	50.2	52.8	53.5
Coal for electricity generation £ thousand tons£ ©	8007.8	9528.6	10832.6	12139.0	13024.3	10760	20147.5	22107.6	20850.5
Ratio %	32.2	33.2	33.6	33.8	33.5	39.6	43.9	46.4	45.0
Other losses£ thousand tons£ ©	240	225.7	216	229	180.0	155	1685	138.5	143

Air Pollution Caused by Coal Combustion in Zhejiang Province

In 1998

- SO_2 emission: 620 thousand ton
- Smoke dust: 350 thousand ton
- Acid rain covers 96% of the area ,PH 4.05-4.76

Basic Framework of Clean Coal Technology (CCT) in China

• Coal Processing

· Coal Washing

· Coal Compound

· Coal Briquette

· Coal Water Mixture

• High Efficient & Clean Combustion

· CFB

· PFB

· IGCC

• Coal Conversion

· Coal Gasification

· Coal Liquification

· Fuel Cell

• Pollution Control and Wastes Treatment

· Industrial Boiler and Kiln

· Flute Gas Purification

· Comprehensive Utilization of Ash

· Comprehensive Utilization of Low Rank Coal & Coal Washery

Clean Coal

Definition: Clean Coal= Coal Compound + Additives

- **Coal Compound**

Optimized calculation and controlled system by computer are employed.

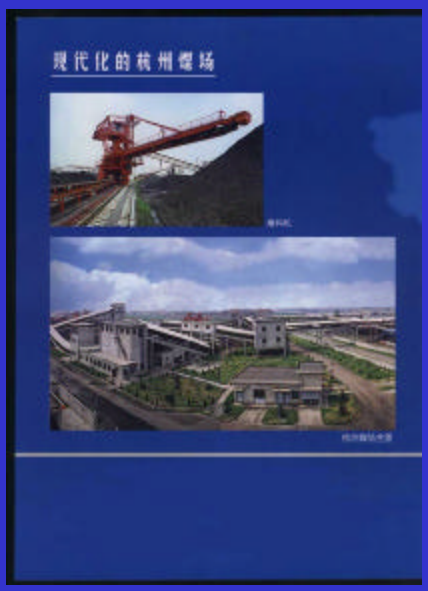
A demonstrative engineering—— Hangzhou Coal Field was built in 1998.

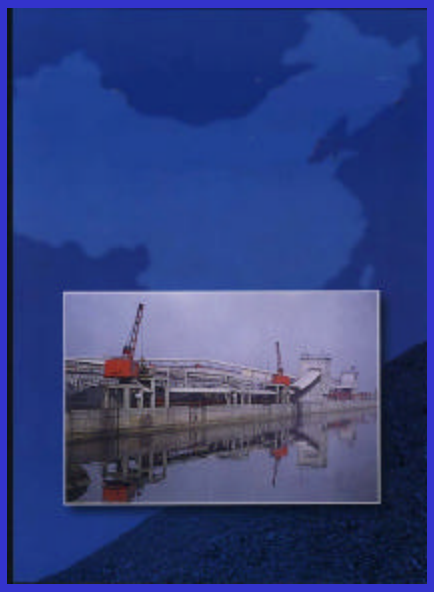
· Covers an area of 20 hectares

· Transportation way: Railway, Water, Road

· Annual product for optimized coal compound: 800 thousand tons

· Annual import & export amount of coal: 3 million tons





- **Additives**

· Combustion assistant additive

5~8% energy saved for industrial boiler and kiln

· Desulphurization additive

Desulphurization rate: 30~40%

For 2-staged injection method, the desulphurization rate can reach 70%

· High-temperature standing additive

T=1200

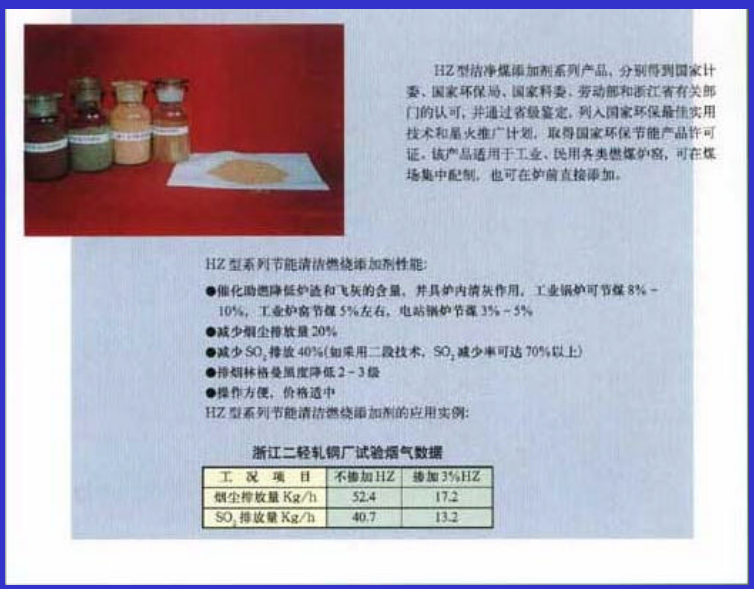
Desulphurization rate= 30~40 %

· Cost

5RMB/T coal

Series Products of Additive for Clean Combustion

Type	Adding ratio
• HZ-1	0.3-0.5%
• HZ-2	3-5%
• HZ-3	5-8%



HZ型洁净煤添加剂系列产品，分别得到国家计委、国家环保局、国家科委、劳动部和浙江省有关部门的认可，并通过省级鉴定，列入国家环保最佳实用技术和星火推广计划，取得国家环保节能产品许可证。该产品适用于工业、民用各类燃煤炉窑，可在煤场集中配制，也可在炉前直接添加。

HZ型系列节能清洁燃烧添加剂性能：

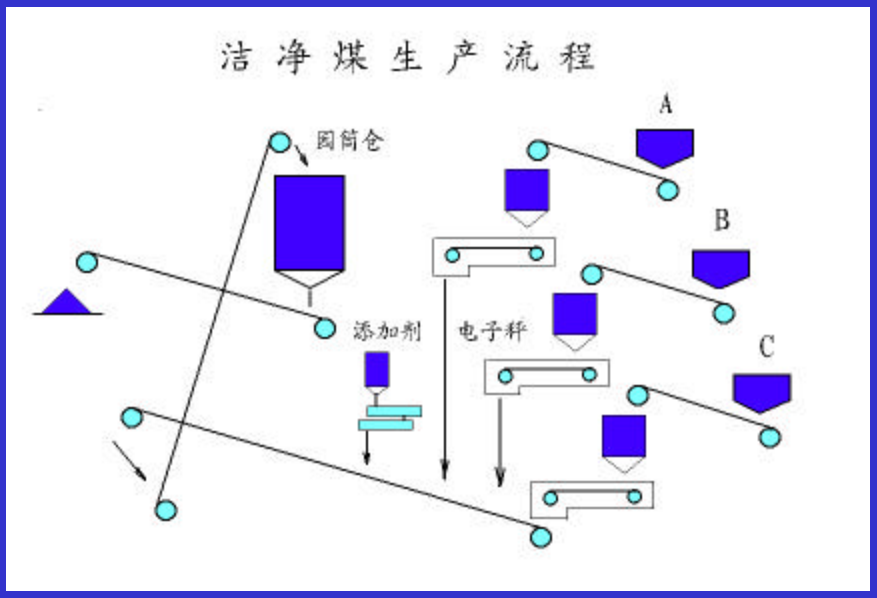
- ●催化助燃降低炉渣和飞灰的含量，并具炉内清灰作用，工业锅炉可节煤8%－10%，工业炉窑节煤5%左右，电站锅炉节煤3%－5%
- ●减少烟尘排放量20%
- ●减少SO_2排放40%(如采用二段技术，SO_2减少率可达70%以上)
- ●排烟林格曼黑度降低2－3级
- ●操作方便，价格适中

HZ型系列节能清洁燃烧添加剂的应用实例：

浙江二轻轧钢厂试验烟气数据

工 况 项 目	不掺加HZ	掺加3%HZ
烟尘排放量 Kg/h	52.4	17.2
SO_2 排放量 Kg/h	40.7	13.2


证 书


洁 净 煤 生 产 流 程
圆筒仓
添加剂
电子秤
A
B
C

The Measured Result of Desulphurization Ratio

Run No.	Users	Boiler Model	Additive Type	Add. ratio	Fixed sulfur ratio	Testing date	Measuring organization
1	Hangzhou Tape Factory	SHL10-13-A	HZ-1	0.3%	62.6%	17 Oct. 1993	Hangzhou Municipal Central Station for Environ. Supervision and Measurement (ESM)
2	Hangzhou Huafeng Paper Mill	BG35/39-M1	HZ-2	3%	48.6%	20Nov. 1996	Hangzhou Institute for Environ. Protection of Coal Science Academy
3	Hangzhou Match Factory	SZL6-1.6-AIII	HZ-2	3%	41.5%	10Mar. 1998	Zhejiang Provincial Central Station for Enviro. Supervision and Measure.
4	Shanghai Mailbag Plant	DZL4-1.25AII	HZ-2	3%	47.1%	19June 1998	Shanghai Municipal Center for ESM
5	Hangzhou Meiyuan Hotel	DZL4-1.25AII	HZ-3	7%	75.1%	18Janu. 1999	Hangzhou Municipal Central Station for ESM

Result of Heat Engineering Measurement

Run No.	Users	Boiler model	Additive Type	Add. Ratio	Thermal Efficiency % /Added	Coal saving rate	Test date	Test Org.
1	Hangzhou Tape Factory	SHL10 -13-A	HZ-1	0.3%	68.54-76.14 /11.09 %	14.5%	Oct.17 1993	3*
2	Linan Huaneng Qingshan Heat and Power Plant	BG35/ 39-M1	HZ-1	0.3%	74.11-78.09 /3.98%	5.1%	May13 1996	3*
3	Hangzhou Huafeng Paper Mill	BG35/ 39-M1	HZ-2	3%	77.32-80.49 /3.17%	3.94%	Nov.20 1996	1*
4	Hangzhou Match Factory	SZL6-1.6AIII	HZ-1	0.5%	74.1-79.73 /5.63%	7.06%	Nov.8 1996	1*
5	Hangzhou Rubber Overshoes Factory	DZL4-1.3-AII	HZ-2	3%	64.93-68.99 /4.0%	6.1%	Aug.10 1998	2*

1*:State EPI, 2*: Zhejiang Provincial Station for ESM, 3*: Hangzhou Municipal Station for ESM

Clean Coal Briquette

Three key techniques:

- Coal Compound
- Additives
- Binders

To reach the results:

- Decrease smoke blackness for industrial furnace and kiln
- Improve burning out
- Decrease SO_x emission
- Reduce dust emission

Cost

Price: 320~350 RMB/T coal briquette

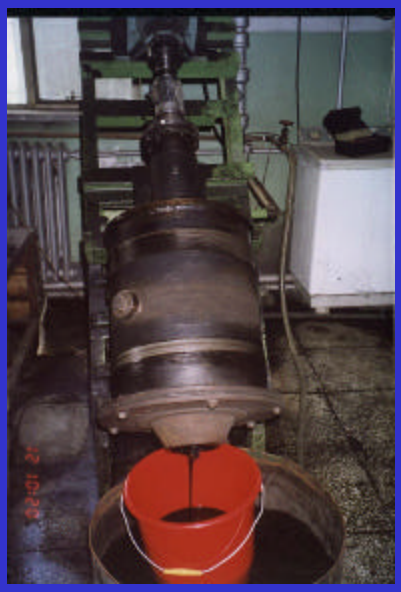
Dp= 50~70 RMB/T coal


'94 4 8


'94 4 3

Coal Water Mixture (CWM)

- About 67~70%—— Coal
  ~ 1%—— Additive
  ~ 30%—— Water
  average d_p=50μm
  d_{max}<300~500μm
  Volatile≤ 33%
  Ash content 6~9%
  Sulphur < 0.5%
  Qnet 17.6~20.1MJ/kg
- Boiler efficiency in industrial furnace is about 85~90%
  · smokeless
  · low NO_x
  · low SO_x
- Price:400~500 RMB/T CWM
  DP:150~200 RMB/T CWM



Example: 1T/h Boiler Burning CWM in Qingdao

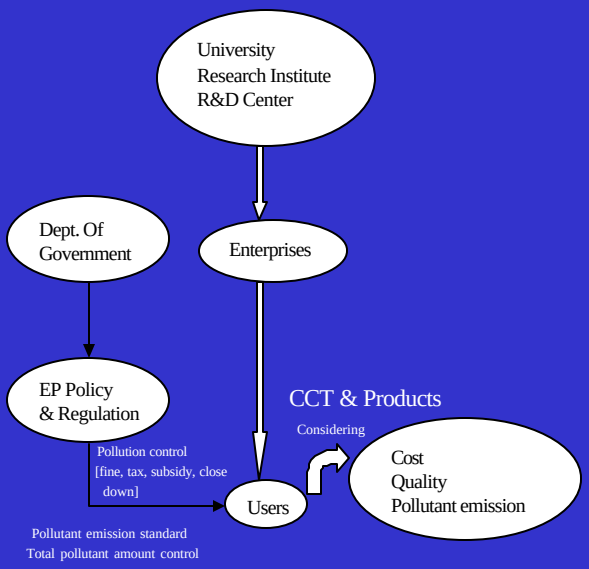
- **Environment Result**
  - ·Smoke Blackness: <1 grade
    [local standard: 1 grade]
  - · Dust: 82.3 mg/m^3
    [local standard: 250 mg/m^3]
  - · SO_x Emission: 610 mg/m^3
    [local standard: 1200 mg/m^3]
- **Boiler Efficiency: 82%**

Example: Economic Comparison (CWM with Coal)

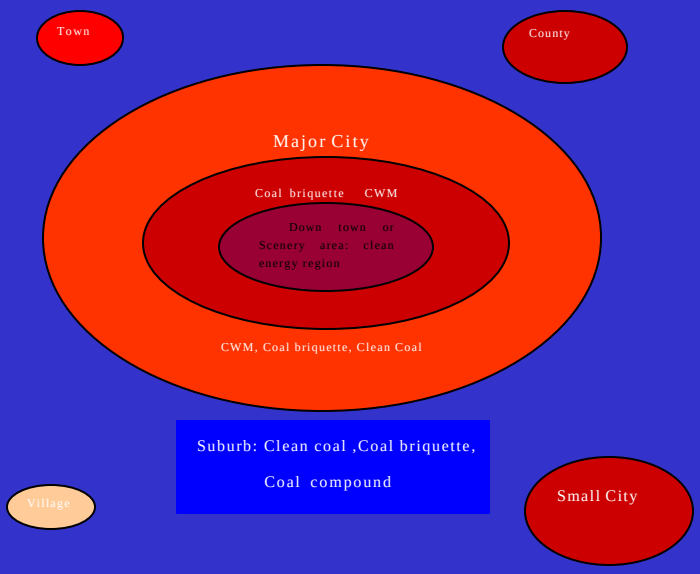
Boiler: / Run	2 t/h Boiler 108 24h CWM	2 t/h Boiler 108 24h Oil	2 t/h Boiler 108 8h CWM	2 t/h Boiler 108 8h Oil	4 t/h Boiler 215 24h CWM	4 t/h Boiler 215 24h Oil	4 t/h Boiler 215 8h CWM	4 t/h Boiler 215 8h Oil
	21.2	26.6	21.2	26.6	27.5	39.78	27.5	39.78
	21	8.6	21	8.6	28	12	28	12
Invest	42.2	35.2	42.2	35.2	55.5	51.78	55.5	51.78
	3907	3259	3907	3259	2581	2408	2581	2408
	318	110	318	110	632.4	221.6	632.4	221.6
	110	--	110	--	221.6	--	221.6	--
	160	330	160	330	316.2	664.8	316.2	664.8
	330	--	330	--	664.8	--	664.8	--
	84.4	70.56	84.4	70.56	111	103.7	111	103.7
Oper. Cost/day RMB	3934	7990	1695	2711	7700	16059	3305	5428
	1.51	3.08	1.96	3.14	1.5	3.11	1.92	3.16
	CWM	Oil	CWM	Oil	CWM	Oil	CWM	Oil

4000kcal/kg 85% 20

Dissemination Mode for CCT



Market Division for CCT & Products According to Region Function



Market Division According to Furnaces

- Coal compound & Clean Coal
  Suitable for: · power station boiler
  · larger industrial furnace
  · Dp≤5 RMB/T coal
- Coal Briquette
  Suitable for: · Smaller industrial furnace
  · kiln
  · Direct burning furnace
  · Dp= 50~70 RMB/T
- CWM
  Suitable for: · power station boiler in city
  · industrial furnace in city & some protection area
  · some special kiln
  · Dp= 150~200 RMB/T

Thanks !